National Space Policy Secretariat
Cabinet Office, Government of Japan

Status Update on the Quasi-Zenith Satellite System (QZSS)

Vienna, Austria

27 September – 1 October 2021

Hongo Nobuo

National Space Policy Secretariat

Cabinet Office, Government of Japan

ICG International Committee on Global Navigation Satellite Systems

National Space Policy Secretariat
Cabinet Office, Government of Japan

Contents

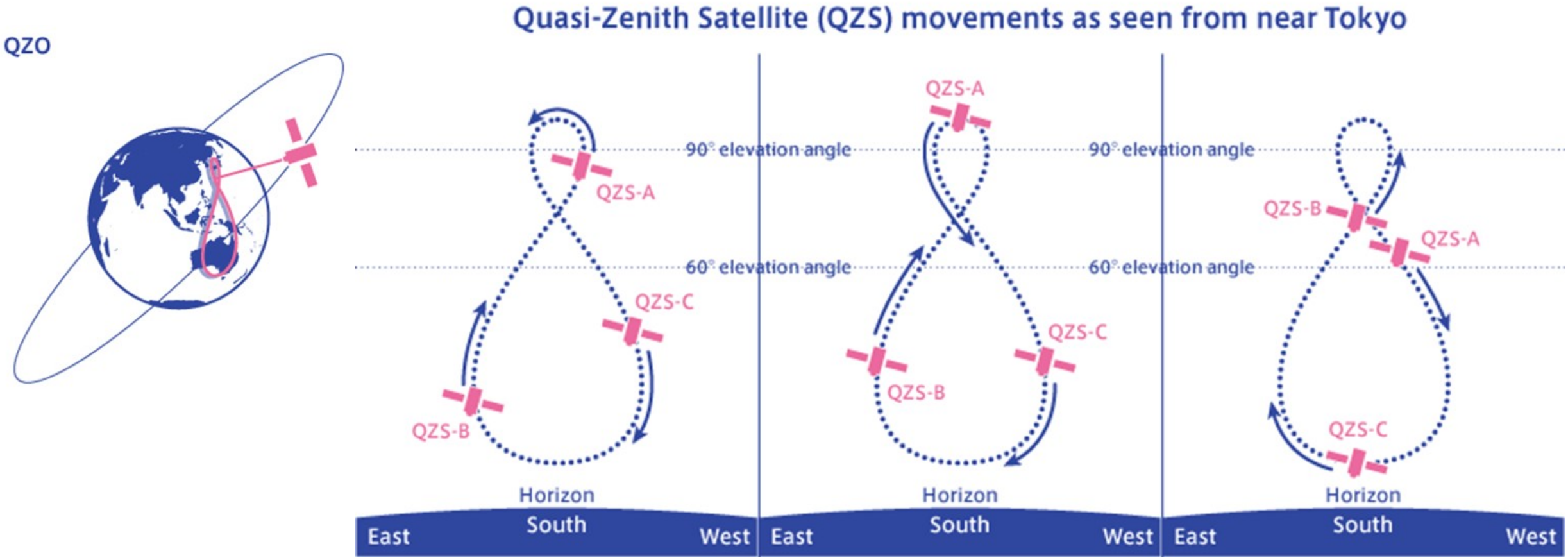
1. Design / Concept
2. Constatation / Launch plan
3. System architecture / configuration
4. Service / Use case
5. Standardization

1.Design / Concept

Cabinet Office
National Space Policy Secretariat

1.Design / Concept

How mitigate the effects of multipath and DOP in urban areas.



Satellites stay ***13 hours in the northern hemisphere***
11 hours in the southern hemisphere,
allowing them to remain near Japan for a long period of time.

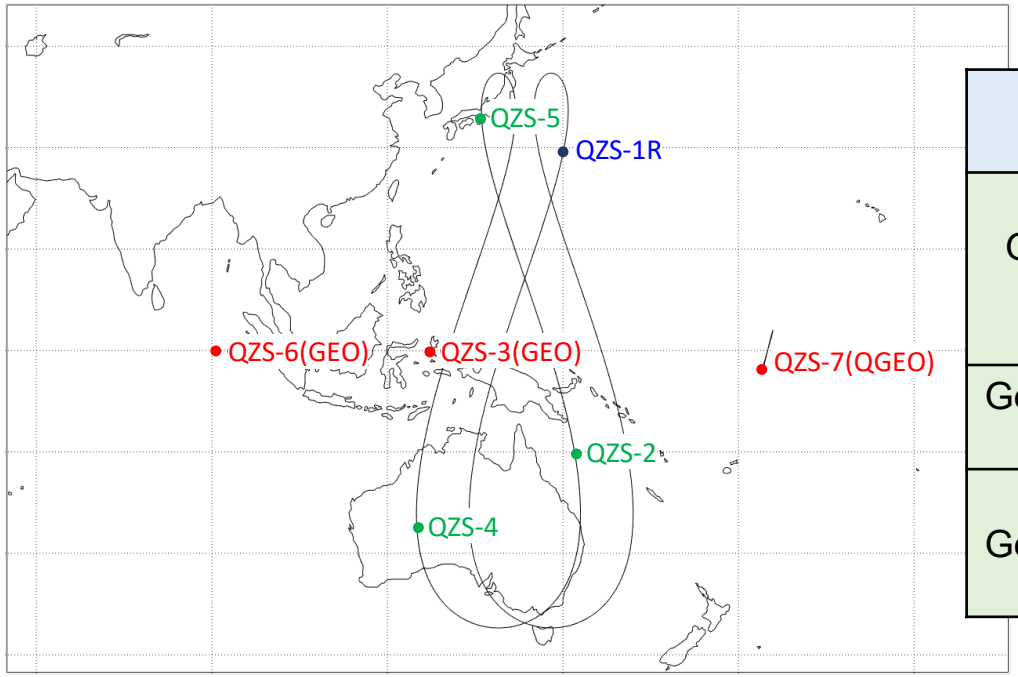
Cabinet Office
National Space Policy Secretariat

2. Constatation / Launch plan

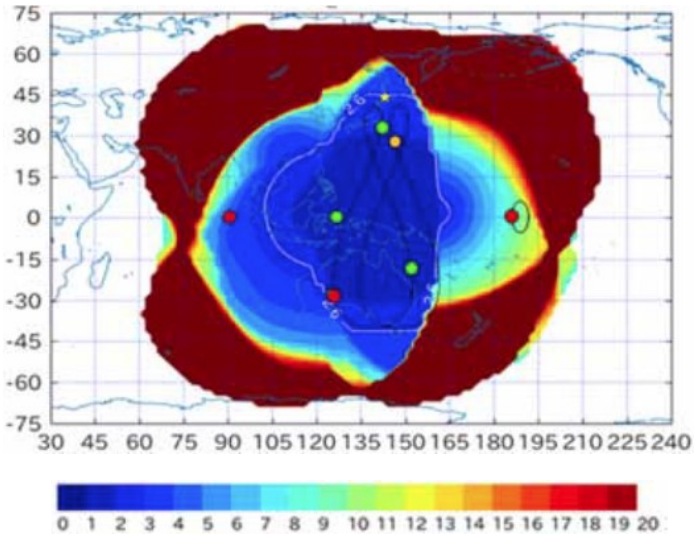
Cabinet Office
National Space Policy Secretariat

2. Constatation / Launch plan

QZS & GEO : How ensure service capability.

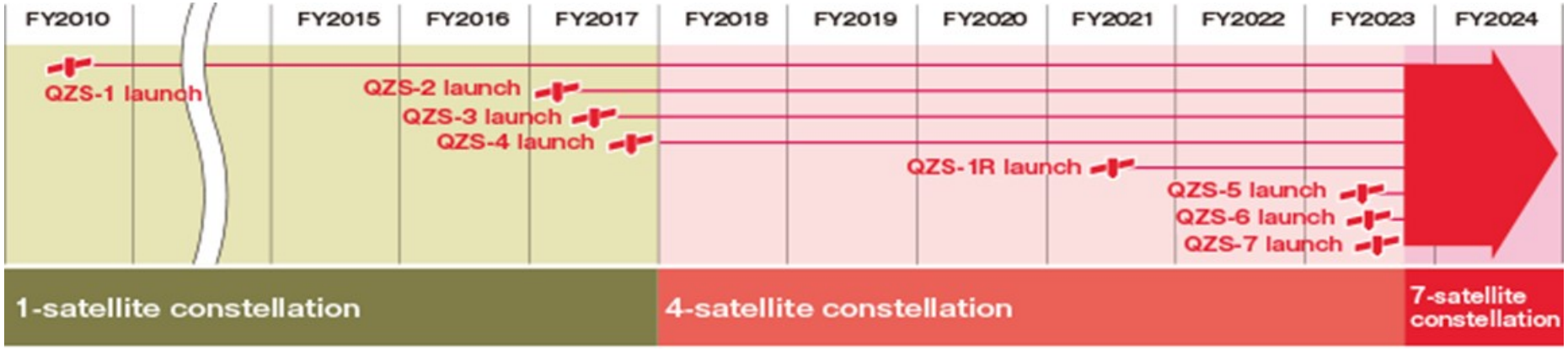


Satellite orbit	Satellite Number	Orbital Position
Inclined Geosynchronous Orbit (4 satellites)	QZS-1R QZS-2 QZS-4 QZS-5	148 deg E 139 deg E 139 deg E 139 deg E
Geostationary Orbit (2 satellites)	QZS-3 QZS-6	127 deg E 90.5 deg E
Quasi Geostationary Orbit (1 satellite)	QZS-7	175 deg W



HDOP

Constellation plan



Cabinet Office
National Space Policy Secretariat

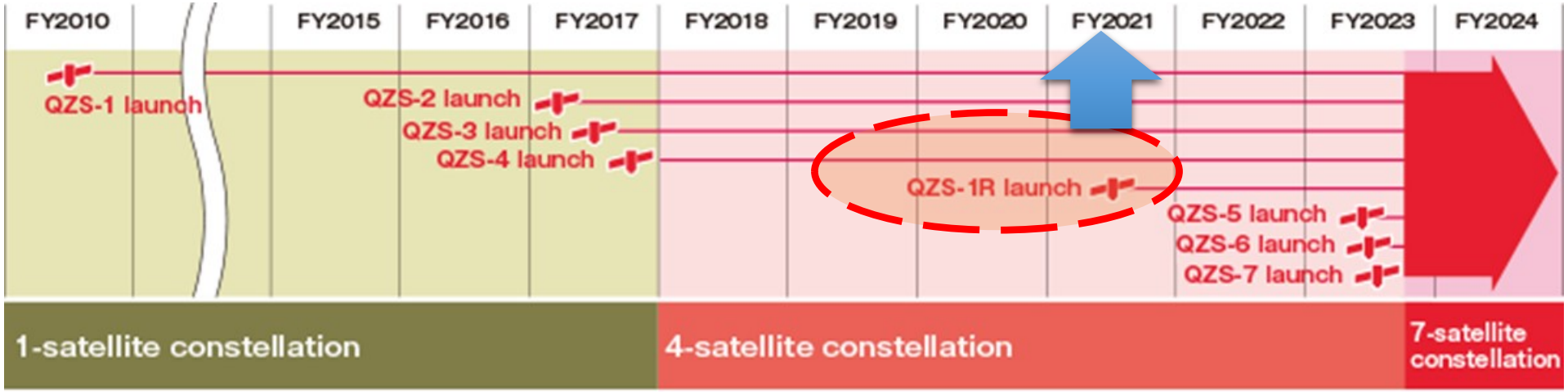
2. Constatation / launch plan

QZS & GEO : How ensure service capability.

H-2A#44

QZS-1R

Constellation plan



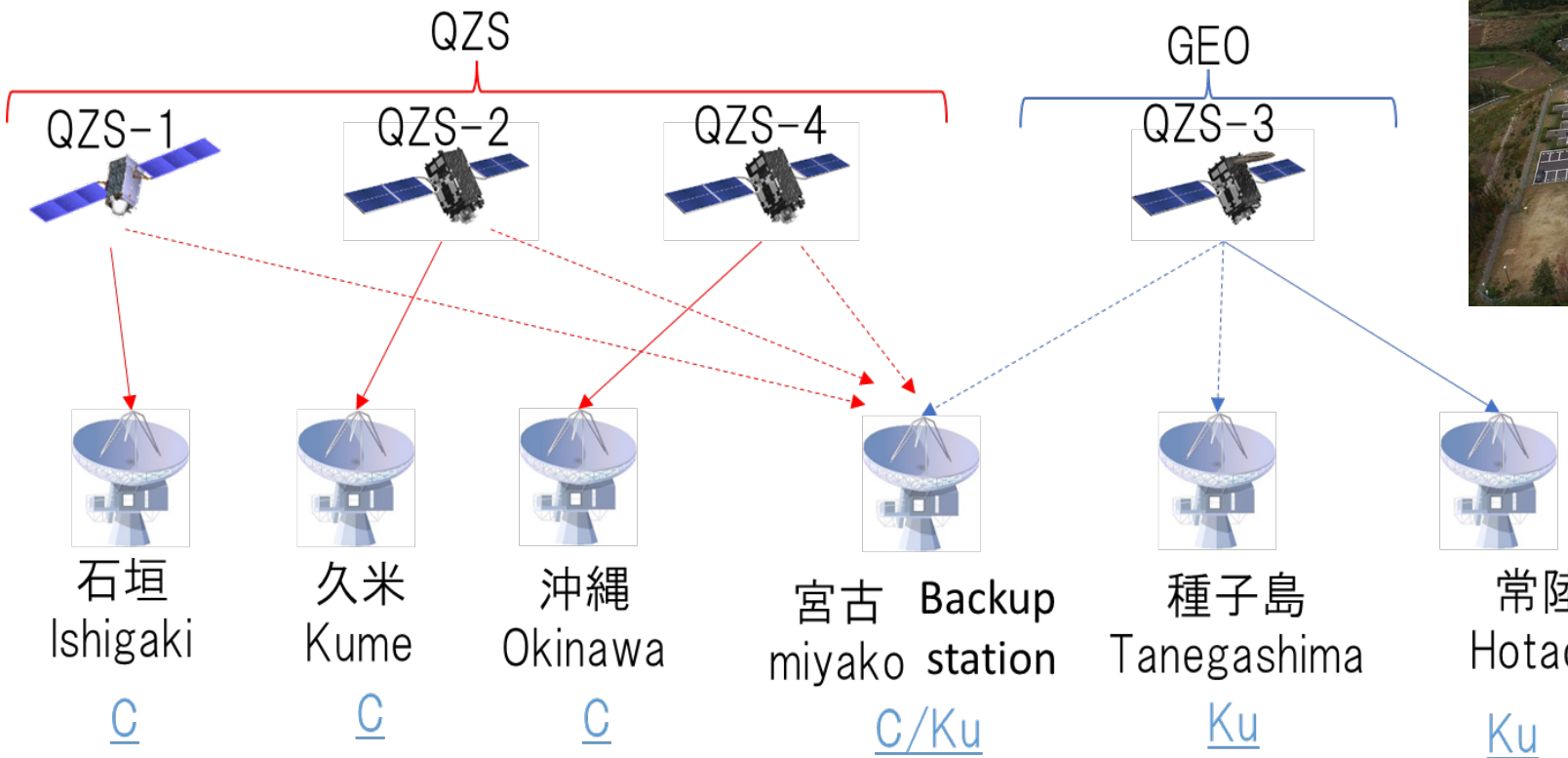
Cabinet Office
National Space Policy Secretariat

3.System architecture / configuration

Cabinet Office
National Space Policy Secretariat

3.System architecture / configuration

How ensure resilience.



Master station
Hitachioota

QZSS ground system deployment

TTC

Cabinet Office
National Space Policy Secretariat

4.Service / Use case

https://qzss.go.jp/info/archive/honda_210517.html

Cabinet Office
National Space Policy Secretariat

4.Service / Use case

Augmentation Service

SLAS : sub m segmentation

Augmentation

Augment 13 satellites (GPS L1C / A, QZS L1C / A) to utilize 13 monitor station.

Disaster reports could broadcast at 4-second intervals using SLAS slots.

Accuracy 95％

	Horizontal	Vertical
Narrow	1.0m	2.0m
Wide	2.0m	3.0m

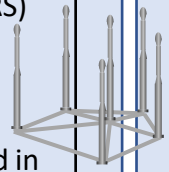
https://qzss.go.jp/info/archive/honda_210517.html

Level.3＠Honda Legend

CLAS : cm augmentation

Augmentation

Utilize real-time Continuously Operating Reference System (CORS) data.



Ionosphere and troposphere correction information is provided in 13 block units.

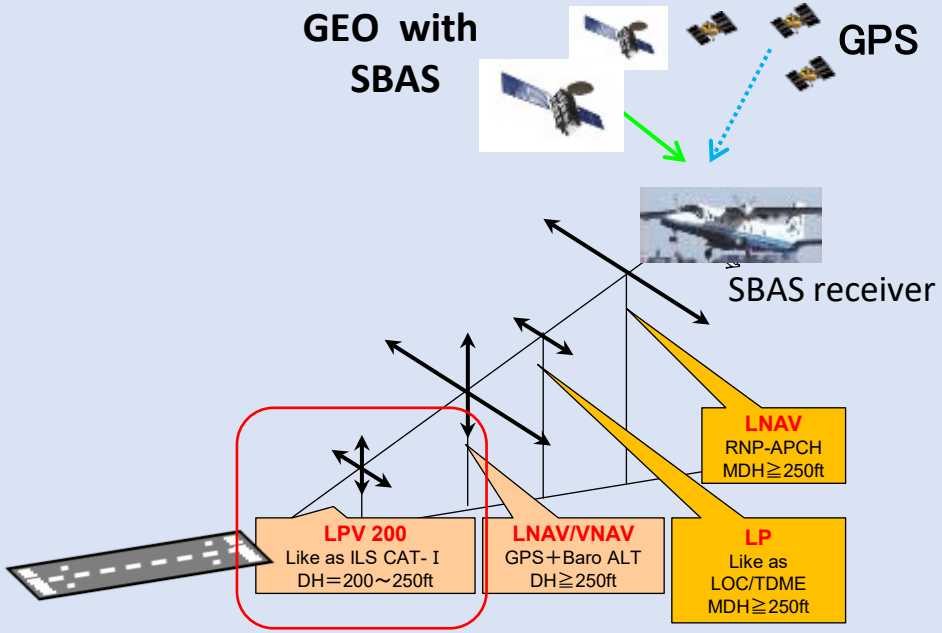
Accuracy 95％

	Horizontal	Vertical
Fixed	6cm	12cm
Mobile	12cm	24cm

https://qzss.go.jp/info/archive/lbj_210510.html

Level.2＠Nissan Ariya

SBAS＠LPV200



Approach		Horizontal alert limit	Vertical alert limit
NPA Non-Precision Approach	LNAV	556m	–
	LP	40m	–
APV Approach with vertical guidance	LNAV/VNAV	556m	–
	LPV	40m	50m
	LPV200	40m	35m
PA Precision Approach	CAT1	16m	35～10m

Cabinet Office
National Space Policy Secretariat

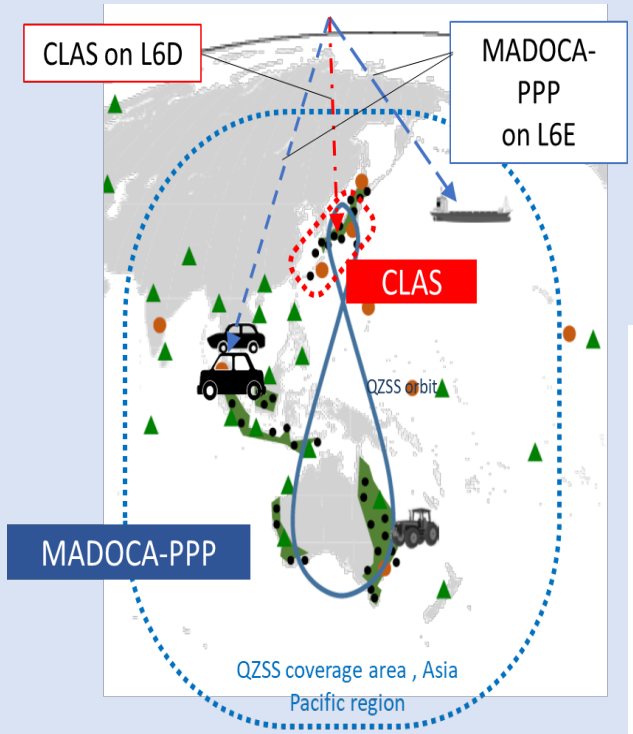
4.Service / Use case

Augmentation Service

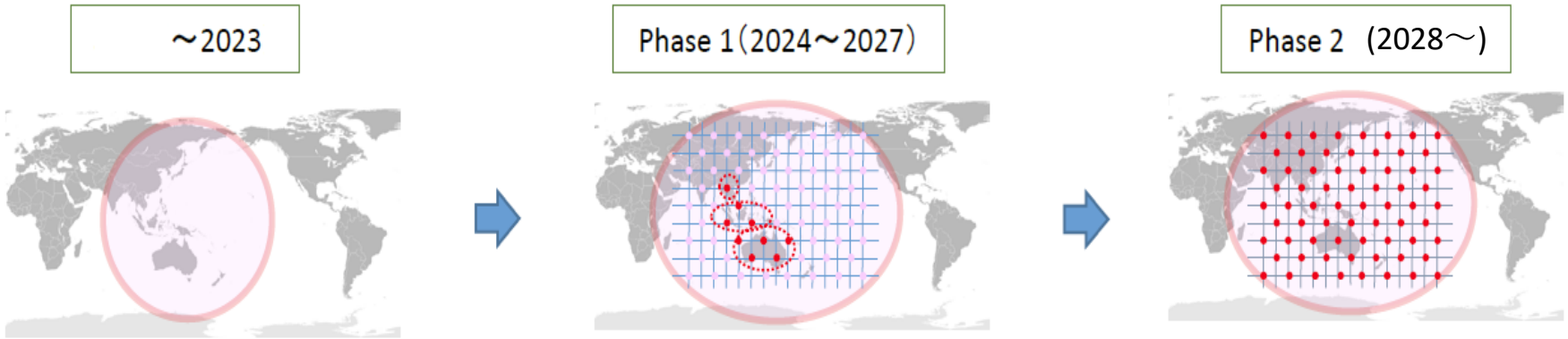
MADOCA PPP : cm augmentation for Asia pacific region

MADOCA : Multi-GNSS Advanced Demonstration tool for Orbit and Clock Analysis

PPP : Precision Point Positioning



- Augmentation on PPP with MADOCA has been provided via L6E signal on QZS-2/3/4.
- MADOCA: Multi-GNSS Advanced Demonstration tool for Orbit and Clock Analysis is a precise POD engine developed by JAXA.

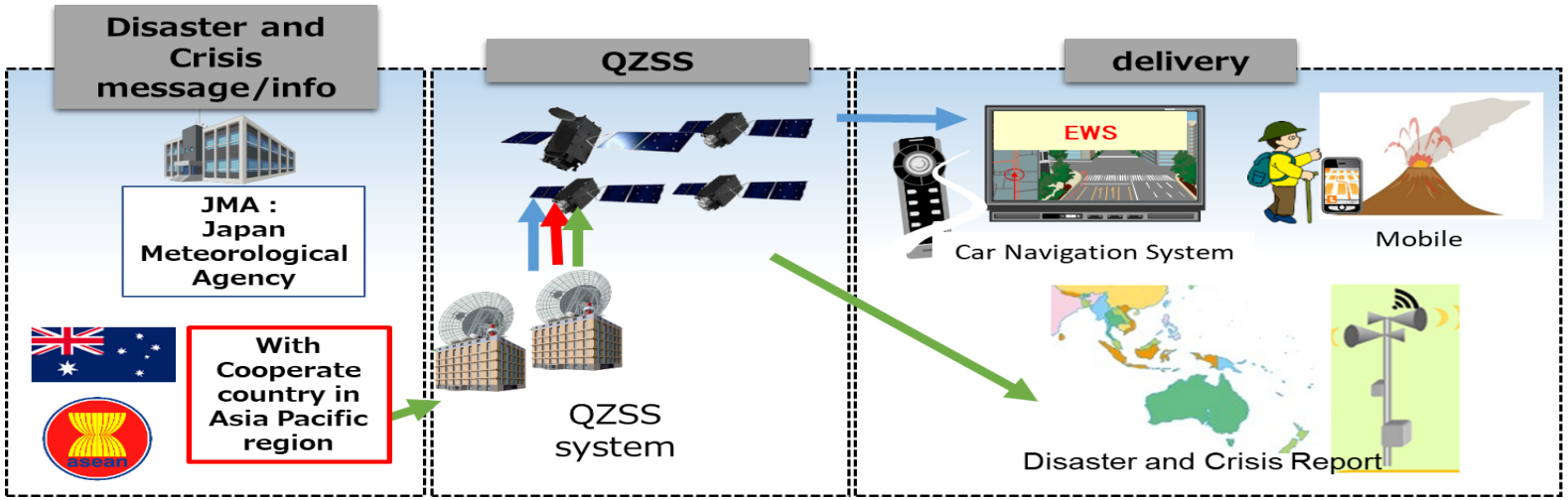


4.Service / Use case

Messaging services

Early Warning Service (EWS)

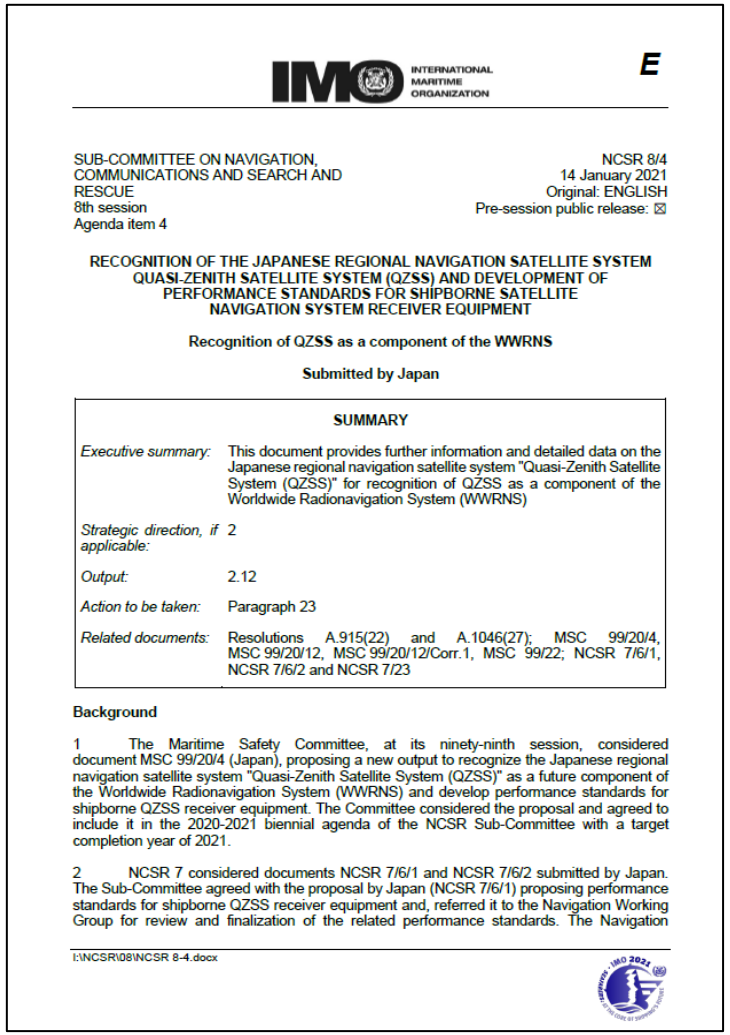
- QZSS L1S signal is sharing 250 bps data stream with SLAS and Disaster and Crisis Report (DCR) service.
- DCR service is currently providing weather information generated by JMA for domestic users in Japan.
- **<u>Common EWS format collaborate with Galileo (EC/EU).</u>**
- QZSS EWS system will enhanced to Asia Pacific region in 2024-2025.
- Demonstration will be conduct for Australia , Thai and Fiji.



Cabinet Office
National Space Policy Secretariat

Standardization

For improving GNSS world



E

SUB-COMMITTEE ON NAVIGATION, COMMUNICATIONS AND SEARCH AND RESCUE
8th session
Agenda item 4

NCSR 8/4
14 January 2021
Original: ENGLISH
Pre-session public release: ☒

RECOGNITION OF THE JAPANESE REGIONAL NAVIGATION SATELLITE SYSTEM QUASI-ZENITH SATELLITE SYSTEM (QZSS) AND DEVELOPMENT OF PERFORMANCE STANDARDS FOR SHIPBORNE SATELLITE NAVIGATION SYSTEM RECEIVER EQUIPMENT

Recognition of QZSS as a component of the WWRNS

Submitted by Japan

SUMMARY

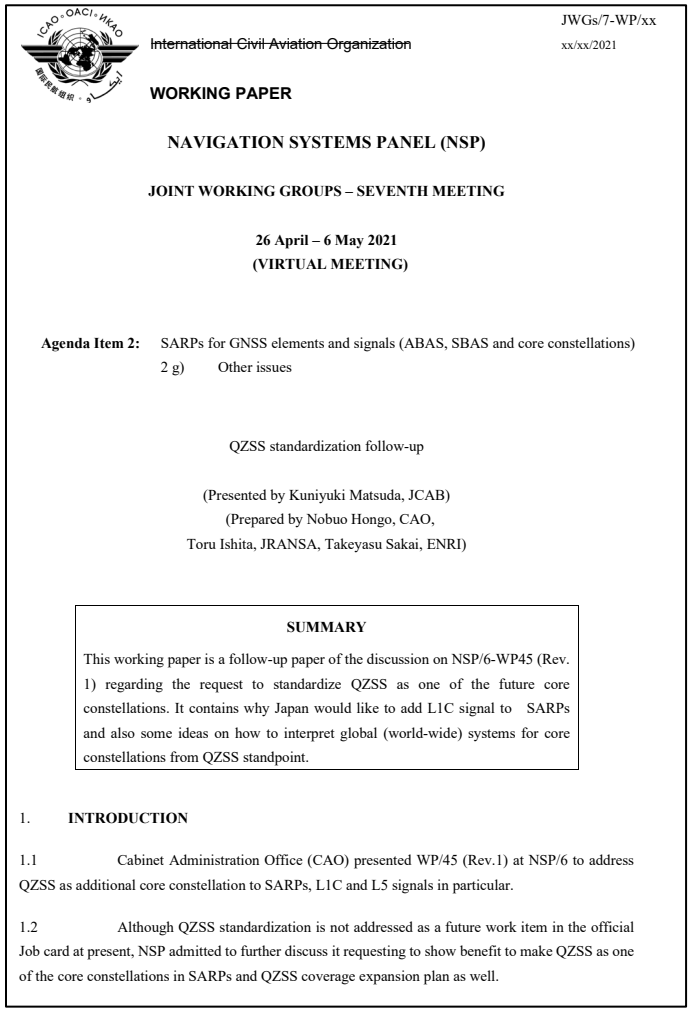
Executive summary:	This document provides further information and detailed data on the Japanese regional navigation satellite system "Quasi-Zenith Satellite System (QZSS)" for recognition of QZSS as a component of the Worldwide Radionavigation System (WWRNS)
Strategic direction, if applicable:	2
Output:	2.12
Action to be taken:	Paragraph 23
Related documents:	Resolutions A.915(22) and A.1046(27); MSC 99/20/4, MSC 99/20/12, MSC 99/20/12/Corr.1, MSC 99/22; NCSR 7/6/1, NCSR 7/6/2 and NCSR 7/23

Background

1 The Maritime Safety Committee, at its ninety-ninth session, considered document MSC 99/20/4 (Japan), proposing a new output to recognize the Japanese regional navigation satellite system "Quasi-Zenith Satellite System (QZSS)" as a future component of the Worldwide Radionavigation System (WWRNS) and develop performance standards for shipborne QZSS receiver equipment. The Committee considered the proposal and agreed to include it in the 2020-2021 biennial agenda of the NCSR Sub-Committee with a target completion year of 2021.

2 NCSR 7 considered documents NCSR 7/6/1 and NCSR 7/6/2 submitted by Japan. The Sub-Committee agreed with the proposal by Japan (NCSR 7/6/1) proposing performance standards for shipborne QZSS receiver equipment and, referred it to the Navigation Working Group for review and finalization of the related performance standards. The Navigation

I:\NCSR\08\NCSR 8-4.docx



JWGs/7-WP/xx
xx/xx/2021

~~International Civil Aviation Organization~~

WORKING PAPER

NAVIGATION SYSTEMS PANEL (NSP)

JOINT WORKING GROUPS – SEVENTH MEETING

26 April – 6 May 2021
(VIRTUAL MEETING)

Agenda Item 2: SARPs for GNSS elements and signals (ABAS, SBAS and core constellations)
2 g) Other issues

QZSS standardization follow-up

(Presented by Kuniyuki Matsuda, JCAB)
(Prepared by Nobuo Hongo, CAO,
Toru Ishita, JRANSA, Takeyasu Sakai, ENRI)

SUMMARY

This working paper is a follow-up paper of the discussion on NSP/6-WP45 (Rev. 1) regarding the request to standardize QZSS as one of the future core constellations. It contains why Japan would like to add L1C signal to SARPs and also some ideas on how to interpret global (world-wide) systems for core constellations from QZSS standpoint.

1. **INTRODUCTION**

1.1 Cabinet Administration Office (CAO) presented WP/45 (Rev.1) at NSP/6 to address QZSS as additional core constellation to SARPs, L1C and L5 signals in particular.

1.2 Although QZSS standardization is not addressed as a future work item in the official Job card at present, NSP admitted to further discuss it requesting to show benefit to make QZSS as one of the core constellations in SARPs and QZSS coverage expansion plan as well.

Cabinet Office
National Space Policy Secretariat

Summary

- Conduct 7 satellites constellation in 2023 .
  Ensure resilience and expand capability.
- Interoperability for Common EWS format with Galileo (EC/EU).
- Develop technical cooperation for EWS in SE Asia.
- Need your advice to accommodate IMO/ICAO standards

Thank you for your attention

[Movie] Quasi-Zenith Satellite System “QZSS”

https://qzss.go.jp/en/overview/downloads/movie_qzss.html

[Movie] Quasi-Zenith Satellite System “QZSS” | Service Overview | QZSS (Quasi-Zenith Satellite System) - Cabinet Office (Japan)

Cabinet Office
National Space Policy Secretariat